DOCUMENT RESUME

ED 153 829 SE 024 126

AUTHOR Jennings, Vivan M.; Ryar, Stephen O.
TITLE Iowa Commercial Pesticide Applicator Manual, Category 5: Aquatic Pest Control. CS-17.
INSTITUTION Iowa State Univ. of Science and Technology, Ames. Cooperative Extension Service.
PUB DATE Jan 76
NOTE 16p.; For related documents, see SE 023 740, SE 024 060-061 and SE 024 120-133

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Certification; Environment; Herbicides; *Pesticides; Safety; *Water Resources; *Weeds
IDENTIFIERS Iowa; *Pests

ABSTRACT

This manual provides information needed to meet specific standards for certification as a pesticide applicator. The text is concerned with the control of aquatic weeds in a variety of water use situations, i.e. static water, limited-flow impoundments and moving water. Also discussed are the principles of limited area application such as surface or bottom acre-foot treatments. The last section deals with the special problems associated with the application of aquatic herbicides. (CS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED153829

Iowa
Commercial Pesticide Applicator Manual

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

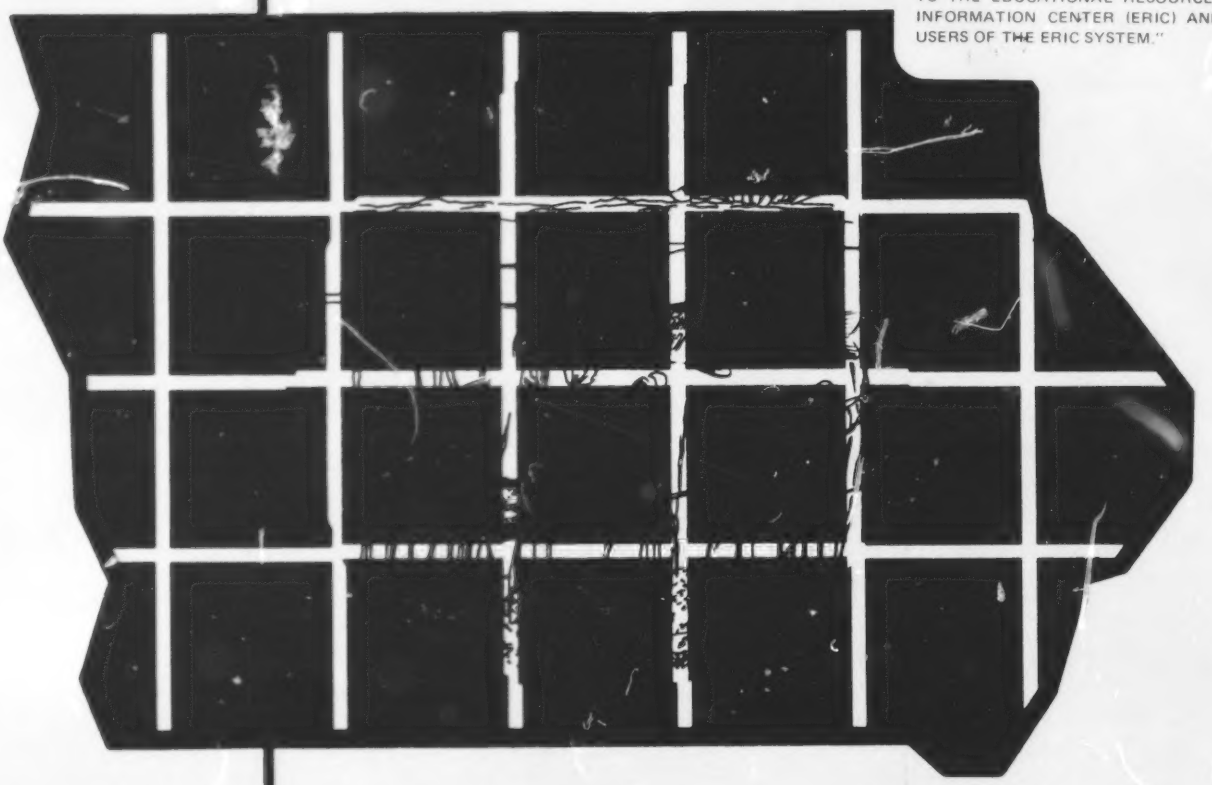
"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Vivan Jennings

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

CATEGORY 5

AQUATIC PEST CONTROL



This manual is to be used for certification training in conjunction with the U. S. Department of Agriculture – U. S. Environmental Protection Agency manual, **Apply Pesticides Correctly,** EPA-335.

Cooperative Extension Service
IOWA STATE UNIVERSITY
Ames, Iowa 50011

CS-17
January 1976

SE 024 126

This manual has been developed for individuals wishing to become certified in commercial pesticide applicator category 5, Aquatic Pest Control. It contains specific information that an individual must know before becoming certified in category 5. The manual has been designed to supplement the general information contained in the core manual Apply Pesticides Correctly - A guide for commercial applicators (plus an Iowa State University supplement) and should not be used for certification preparation without referring to the core manual as well.

Prepared by Vivan M. Jennings, extension weed specialist, and Stephen O. Ryan, pesticide training coordinator, who express appreciation to the University of Georgia and Kansas State University for the use of source material.

CONTENTS

Introduction	1
Aquatic Weeds	1
Water Use Situations	2
Static Water	2
Limited-Flow Water Impoundments	3
Moving Water	3
Control of Aquatic Weeds with Herbicides	3
Principles of Limited Area Application of Aquatic Herbicides	7
Surface-Applied Treatments	7
Total Water Column Treatments	7
Bottom Acre-Foot Treatments	8
Special Problems Associated with the Application of Aquatic Herbicides	8
Improper Application Rates	8
Incorrect Formulation	9
Faulty Application	9
Suggested References	10

INTRODUCTION

The use of herbicides to control aquatic vegetation is complicated by the use of the water from the treated area. The water may be used by humans, livestock, or by fish and wildlife. Flowing water may be utilized further downstream and thus effects of chemicals used on plants, animals, fish and wildlife need to be considered. Vegetation often needing control includes algae, submersed weeds, emersed weeds, marginal weeds and floating weeds growing near the shoreline.

Aquatic Weeds

Algae: Two major forms of freshwater algae are phytoplankton (planktonic) and filamentous. Planktonic and filamentous algae may clog filters in water treatment plants and produce undesirable tastes and odors in drinking water. Filamentous algae interfere with irrigation systems by clinging to structures and concrete linings and clogging weirs and screens. In ponds and lakes, filamentous algae can reduce fish population. All species of filamentous algae are considered a nuisance wherever they occur. Important filamentous algae include: spirogyra (Spirogyra spp.), cladophora (Cladophora spp.), pithophora (Pithophora spp.), and chara (Chara spp.).

Submersed Weeds: Most submersed plants are true seed plants with roots, stems, and leaves. Rooted on the bottom, these plants grow chiefly below the surface, although their flowers and seeds and a few leaves may extend above it. A maximum depth of 10 to 12 feet in clear water is the limit of habitat for most submersed plants. Important submersed weeds include: pondweeds (Potamogeton spp.), elodea (Elodea spp.), watermilfoil (Myriophyllum spp.), coontail (Ceratophyllum spp.), naiads (Najas spp.), bladderwort (Utricularia spp.), and buttercup (Ranunculus spp.).

Emersed Weeds: Emersed plants are those plants that are rooted in the bottom and produce most of their leaves and flowers at or above the surface. Leaf shape, size and point of attachment are variable within this group. Leaves of emersed plants do not rise and fall with the water level as do those of attached, floating plants. Important emersed weeds include: lotus (Nelumbo spp.),

waterlilies (Nymphaea spp.), watershield (Brasenia spp.), arrowhead (Sagittaria spp.), water primrose (Jussiaea spp.), and water willow (Justicia spp.).

Marginal Weeds: Marginal weeds are emersed weeds that can and frequently grow on saturated soil above the water surface. These weeds vary in size, shape and habitat. They may be found growing in moist soils along shorelines into water up to 2 feet in depth. Important marginal weeds are: reeds (Phragmites spp.), sedge (Carex spp.), bulrush (Scirpus spp.), cattails (Thypha spp.), smartweeds (Polygonum spp.), willow (Salix spp.), cottonwood (Populus spp.), salt cedar (Tamarix spp.), and rushes (Juncus spp.).

Floating Weeds: Some plants are free-floating while others rooted in the bottom have floating leaves that rise or fall with the water level. Many floating plants reproduce rapidly and are among the most troublesome aquatic weeds. Duckweeds (Lemna spp.) and watermeal (Wolfia spp.) are important weeds in this group.

WATER USE SITUATIONS

Habitats for aquatic weeds involve various proportions of water and soil, from intermittently wet ditches, to ditches which always hold standing water, to streams, to stock ponds, to farm ponds, to lakes, and to intermediate habitats. For purposes of this discussion, however, we can confine our attention to three types of water use situations.

Static Water

Static water can be defined as water confined for considerable periods of the year, or totally confined within a known area with no movement of water to downstream locations. If a herbicide is applied for weed control, there is no reason to expect that any appreciable downstream effect may occur except overflow resulting from unusual storm conditions. Water impoundments such as stock ponds, and in some cases farm ponds, will fit into this category.

Limited-Flow Water Impoundments

This type refers primarily to farm ponds, lakes, and ditches. Ditches may be intermittently wet and dry depending upon local climatic conditions. However, herbicides applied to habitats such as ditches may present some hazard to downstream locations due to movement of the applied pesticide following an influx of water from surrounding areas. The purpose of the ditch is to drain the surrounding land area so considerable amounts of water must pass through the ditch area. In addition, many farm ponds may be characterized as having limited flow since there nearly always is an overflow pipe and an emergency overflow channel (spillway). The overflow pipe is designed to permit passage of a continuous and relatively well-defined amount of water at all periods of the year. The emergency spillway is provided to permit outflow of water from the pond at periods of the year when storm incidence may cause excess amounts of water to accumulate in the pond. In such cases, pesticide applications to limited-flow water areas may be found in small amounts in waters downstream from the application site. It is conceivable that larger amounts of pesticides from a treated area may be found downstream in the event of sudden rain storms which interrupt or come immediately after pesticide application.

Moving Water

Moving water is characterized as water found in creeks, streams, and rivers where there is always some detectable movement. Applied pesticides may be found in downstream locations in varying amounts away from the area of original application. Such situations present the greatest potential for concern as an environmental hazard.

CONTROL OF AQUATIC WEEDS WITH HERBICIDES

Herbicides are frequently the preferred method for control of aquatic weeds in providing effective, longer-lasting control than other methods. However, even the most effective chemical methods frequently must be combined with hand or mechanical weeding to remove remaining weeds and to prevent future spread by seed or other plant parts.

All herbicides used for aquatic weed control should be applied in accordance with the directions on the manufacturer's label, as registered under the Federal Insecticide, Fungicide, and Rodenticide Act. Most herbicides have a low acute oral toxicity, but a few aquatic herbicides are poisonous to human beings, livestock and other non-target organisms. Some herbicides are toxic to fish, but most do not injure fish at concentrations required for weed control. Proper use of herbicides includes consulting with federal or state game and fish departments for advice if a proposed herbicide application might endanger wildlife, fish or their habitat.

Changes in registrations of old herbicide products or new product registrations may occur before each cropping season. Carefully read the label before using any herbicide.

The following is a summation of the important aquatic weeds in Iowa and their control:

Weed	Herbicide and Formulation Available	Remarks
Algae (pond scrum)	Copper sulfate	Undertake treatment at the very first appearance of algae. Dissolve the correct amount of copper sulfate in lukewarm water and apply by sprayer from shore or from boat as evenly as possibl Do not leave copper sulfate in contact with galvanized metal or tin for any length of time because of chemical reaction. Flush tanks immediately after use. A second method of treatment is to put copper sulfate in a small, fine-mesh cloth sack and drag it behind the boat. A third method is to tie the fine-mesh cloth sack or sacks to inflated tire tubes or to planks and allow them to float around at will until the chemical is dissolved. Start treatment in early spring at the first sign of infestation. In farm ponds, natural decomposition of the chemical is inevitable so retreatments need to be made. Treatment should not cause hazards to non-target organisms in impounded waters or in overflow water from impounded areas if applied as directed on the label.
Emerged broadleaf weeds including: arrowhead, pondweeds, and water lilies. Also willows and cottonwood along drainage ditch banks and shorelines	2,4-D amine or low volatile ester 4 lb. a.e.	Apply evenly to only emerged weeds with actively growing foliage Use low pressure and coarse sprays. Avoid water contamination as much as possible. With heavy infestations, treat only ½ of the area at weekly intervals to prevent oxygen depletion. Treatment should not cause hazards to non-target organisms in impounded waters or in overflow water from impounded areas if applied as directed on the label.
Emerged "grassy" weeds including bulrushes, cattails, sedges and grasses	Dowpon (dalapon)	Apply to actively growing plants until moist. Avoid water contamination as much as possible. Under heavy infestations, treat only ½ of the area at weekly intervals to prevent oxygen depletion. Treatment should not cause hazards to non-target organism in impounded waters or in overflow water from impounded areas if applied as directed on the label.

Aquatic Weed Control (cont)

Weed	Herbicide and Formulation Available	Remarks
Submersed weeds including: all rooted species, e.g. coontail, pondweeds, etc.	Aquathol (endothall) or Aquathol + (endothall + silvex). Several formulations and mixtures	Do not apply to waters that might be used for ingestion, pesticide sprays or domestic or animal water supplies. Do not use fish from treated water for 3 days. Treatment should not cause hazards to non-target organisms in impounded waters or in overflow water from impounded areas if applied as directed on the label.
	Diquat 2 spray	Apply before weed emergence. Do not use water for 10 days. Rapidly absorbed by plant foliage, quickly stopping photosynthesis in a wide range of weeds and grasses. Inactivated on contact with clay particles in soil. Water contaminated with diquat would be a hazard downstream if used for drinking, animal consumption, swimming or spraying before end of waiting period as designated on label.
-for elodea, naiad, coontail, pondweeds and milfoil	Casoron (dichlobinel) 10G	Apply in the spring on actively growing weeds. Use spot treatment on small infestations. Do not use treated water for irrigation, human or livestock consumption. Do not use fish from treated water within 90 days of treatment. Treatment should not cause hazards to non-target organisms in impounded waters or in overflow water from impounded areas if applied as directed on the label.

selected sections of the pond where the pest infestation may be more intense. Specific application techniques include injection directly into the water with the undiluted chemical or some dilution of the chemical sprayed or cast upon the surface of the water. With either method, further dispersal throughout the water column depends upon water currents. Aquatic granules are formulated to provide rapid sink to soil-water interfaces to control emersed and submersed weeds.

Bottom Acre-Foot Treatments

This is a specialized application technique which is intended primarily for control of submersed aquatic vegetation. A boat carrying application equipment drags a hose or boom over and just above the lake or pond bottom. The chemical is dispersed through nozzles, and specific gravity of the chemical causes the treatment to remain near the bottom and in the proximity of the rooted, submersed weeds. Fish can move out of this water level and avoid any direct contact with the chemical until chemical residues are diluted or dissipated.

SPECIAL PROBLEMS ASSOCIATED WITH THE APPLICATION OF AQUATIC HERBICIDES

Improper Application Rates

Proper use of herbicides involves accurate application so that water, vegetation, or soil in an aquatic area is covered uniformly at the rate as recommended on the product label. Properly functioning, accurately calibrated equipment is essential. Application of a herbicide below the rate recommended on the label can result in unsatisfactory control of target aquatic weeds. Herbicide application at a rate higher than the recommended rate for the product can result in greater residue, toxicity and hazard as a result of use of the contaminated water if it is used for drinking, fish, livestock, other non-target organisms, irrigation, or other purposes.

PRINCIPLES OF LIMITED AREA APPLICATION OF AQUATIC HERBICIDES

Aquatic weeds may occur in the whole body of water, as submersed weeds, or may appear to cover the whole surface of the water, as floating weeds. Conversely, the same weeds or other pests may occur only in limited areas within a body of water, whether it is a static, limited-flow, or moving body of water. "Limited area application" implies the advantage of improved safety to aquatic species, specifically the fish population. If pesticides that are potentially toxic to the fish population are applied to a limited area, the fish population can move to untreated water areas and escape potential toxic effects. Also implied in this concept is that a minimal amount of pesticide is applied, which tends to reduce the potential effect upon downstream environments in the event of spillover from the treated body of water.

There are essentially three areas in the body of water which may be treated--the surface, the total water column, and "bottom acre-foot" treatments.

Surface-Applied Treatments

Contact pesticides are generally applied to control floating weeds. Generally only one-fourth to one-third of the surface area of the body of water is treated at a time to reduce the possible hazard of oxygen depletion resulting from too rapid kill of large masses of vegetation in the water which may affect the fish population.

Total Water Column Treatments

In this application technique frequently employed with emersed weeds and often employed with algae treatments, the whole body of water (including the water column from bottom of the water impoundment to the surface) is treated. The entire volume of the body of water is calculated and the chemical is added to reach a specified dilution in the total water column. An alternative is to calculate the entire water body and then treat only one-fourth or one-third of the total water column, based on surface area, confining the treatment to

SUGGESTED REFERENCES

Aquatic Weed Identification and Control Manual
Bureau of Aquatic Plant Research and Control, Florida Department of Natural Resources, Tallahassee, Florida. Price $2.50.

EPA Compendium of Registered Pesticides, Volume I Herbicides and Plant Regulators. 1975.
Lars W. J. Anderson, Herbert L. Dozier, William C. Grosse, William S. Murray, Technical Services Division, Office of Pesticides Programs, U.S. Environmental Protection Agency, Washington, D.C., 20460. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402.)

Guidelines for Weed Control. August 1973.
Agriculture Handbook No. 447, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402.)

Herbicide Handbook of the Weed Science Society of America. Third Edition. 1974.
(For sale from Weed Science Society of America, 425 Illinois Building, 113 North Neil Street, Champaign, Illinois, 61820. Price $5.00).

Herbicide Manual for Noncropland Weeds. August 1970.
K.S. Quisenberry, et al, Agriculture Research Service, U.S. Department of Agriculture.
Army, TM 5-639, Navy NAVFAC MO-341, Air Force, AFM 91-19 Department of the Army, the Navy, and the Air Force, Washington, D.C.
(For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price $1.75.)

Principles of Plant and Animal Pest Control, Volume 2. Weed Control. 1968.
Publication 1597.
National Academy of Sciences, Washington, D.C.

Water Quality Criteria, Second Edition. 1963.
Edited by J. E. McKee and H. W. Wolf, Publication No. 3-A.
The Resources Agency of California, State Water Quality Control Board, Sacramento, California, 95814.

Cooperative Extension Service, Iowa State University of Science and Technology and the United States Department of Agriculture cooperating. Charles E. Donnowe, director, Ames, Iowa. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

. . . AND JUSTICE FOR ALL

Programs and activities of Cooperative Extension Service are available to all potential clientele without regard to race, color, sex or national origin. Anyone who feels discriminated against should send a complaint within 180 days to the Secretary of Agriculture, Washington, D.C. 20250.

Incorrect Formulation

The use of an incorrect formulation can result in:

-- Use of a product that is not safe and may not be registered by EPA for use in that aquatic site.
-- Increased toxicity resulting in death or injury to fish and other non-target organisms.
-- Increased hazard to human beings during application.
-- Increased hazard of injury to desirable non-target plants.
-- Increase in contamination of water that may be used for drinking, livestock, irrigation or other uses.

Faulty Application

Faulty application can be the result of:

-- Improperly calibrated equipment.
-- Use of improper herbicide.
-- Use of improper rate of recommended formulation.
-- Application at improper stage of plant growth of target weeds.
-- Application of foliar applied herbicides when weeds are growing under unfavorable growing conditions.
-- Application to plants, water, or areas not registered for treatment on product label.
-- Application during windy or other undesirable weather conditions.

There are two major hazards involved in faulty application of pesticides:

-- Possible contact of applied pesticide with non-target organisms with resultant damage.
- Failure to apply the pesticide to the target pest resulting in no kill of the desired pest. For example, it would be hopeless to apply granular herbicides in fast moving water, whereas they might work quite well in static water impoundments, and even in limited-flow water situations.